

CHAPTER 28

BICYCLE FACILITIES

28.1 General

This chapter sets forth the minimum criteria to be used in the design of all bike lanes, bike paths, or other bicycles facilities within the District's ROWs or easements.

28.2 References

Listed below are the references to be used in developing bicycle facilities:

- **Current AASHTO, Guide for the Development of Bicycle Facilities**, as published by the American Association of State Highway and Transportation Officials. This reference was the main reference in this chapter.
- American Traffic Safety Services Association (ATSSA)
- Institute of Transportation Engineers (ITE)
- Manual on Uniform Traffic Control Devices (MUTCD) Part 9
- DCMR 18-DC Traffic Laws
- DDOT Bicycle Design Guidelines
- DDOT Web Site [HTTP://www.DDOT.DCGOV](http://www.ddot.dcgov)
 - a) Bicycle Master Plan
 - b) Bicycle Advisory Council
 - c) Program Manager

While all of the above references should be utilized, the final design considerations shall be approved by the DDOT Bicycle Program Manager.

28.3 ADA Requirements

All designs for off-street bicycle paths are considered shared-use paths and shall conform to **ADA** requirements.

28.4 General

The bicycle has become an important element for consideration in the highway design process. Most bicycle travel takes place on the highway system, as it presently exists. Therefore, enhancement of an existing route's safety and capacity for bicycle traffic can be achieved through low-cost measures such as those indicated below:

- Paved shoulders (at least 4 ft.)
- A wide outside traffic lane if no shoulders exist (12 ft. to 15 ft.)
- Bicycle-safe drainage grates
- At-grade manhole covers
- A smooth, clean riding surface
- Bicycle sensitive loop and microwave traffic signal detectors

At certain locations, the existing highway system may be further supplemented by providing specifically designed bikeways for either exclusive or nonexclusive bicycle use. To provide adequately for a bikeway facility, the designer should be familiar with bicycle dimensions, operating characteristics, and requirements. The development and design of bikeway facilities should reflect the criteria presented in the **AASHTO publication "Guide for Development of Bicycle Facilities" third edition.**

28.4.1 Permitted Bicycle Travel Areas

Bicycles are permitted on all roadways in the District of Columbia except where expressly prohibited through appropriate administrative action and subsequent installation at signs.

28.4.2 Maintenance Responsibility

Maintenance and operation responsibility for new bike paths in the public access easement will be determined during the site/subdivision plan approval process. Public access/bike path easements shall be conveyed to the District. The easement width shall be clearly indicated on the site plan or construction plans.

28.4.3 Appurtenances Avoided

Manholes, utility poles or other appurtenances or obstructions, should not be located in bike lanes or bike paths, if possible.

28.5 On-Street Bike Facilities Design Requirements

28.5.1 On-Street Bike Routes

Certain streets are designated in the District Bicycle Plan as on-street bicycle routes. These routes are on streets with lower traffic volumes and speeds or wide outside lanes, and they are marked with bicycle route signs. Some streets within new developments or re-developments must also contain additional roadway width for bike lanes.

28.5.2 Bicycle Lanes

Bicycle lanes shall be placed to the right of the travel lane and to the left of the parking lane. Bicycle lanes on one-way streets shall be on the right side of the street, unless otherwise specified by the District. Refer to the **Roadway** chapter within this manual, for the standard cross section requirements. Bike lane width shall not be less than 5 ft., except where the parking lane is at least 8 ft., in which case, it may be 4 ft., provided it is approved by the Bicycle Program Manager. Streets designated as on-street bicycle routes shall be designed with additional width for bike lanes whenever possible.

28.5.3 Bike Lanes at Intersections

At the intersections where a separate right turn lane exists and is striped, the bicycle lane shall transition and be placed between the thru-lane and the right turn lane.

28.5.4 Signage and Striping

All designated bike lanes shall be striped, including bicycle symbol pavement markings, as required by **MUTCD** and as required in the **Guidelines for Pavement Marking and Signage** chapter within this manual. In addition to the above **MUTCD**, see **District of Columbia's Legend for Pavement Markings**. All signs shown on drawings must have the **District of Columbia's Legend of Signs** provided on each sheet. Use the sign symbols as shown on this legend. Both of these legends must be shown on each plan sheet showing pavement markings and signs. Symbols relating to the sign must be shown above the upper right-hand corner of the sign. Legend for Pavement Markings and Legend for Signs symbols cannot be changed, without prior permission from the Traffic Safety Branch.

28.5.5 Actuation Loop

All loop detectors for actuated traffic signals should detect bicycles. Separate actuation loops are required in bike lanes at signalized intersections. Quadra pole-type loops are required. Where other actuated detection systems are used, such as microwaves, they shall detect bicyclists.

28.6 Off-Street Bicycle Path Design Requirements

28.6.1 Bike Path Location

- A bike path, or shared use path, is defined as a bikeway physically separate from the roadway.
- Location Criteria - Bike path locations shall be based on safety, convenience, circulation, and access considerations.
- Easements - Where needed, a 10 - 20 ft. minimum easement width shall be procured for a 10 ft. wide bike path
- Shared use paths shall be located at least 5 feet from the roadway or separated from the roadway by a vertical barrier at least 42 inches high.

28.6.2 Trees, Vegetation, and Other Obstacles

- Preserving Trees - Where possible, bike paths shall be routed to minimize the loss of trees and disruption of natural environmental conditions.
- Distance from Obstacles - A minimum of 2 ft. is required between the bike path edge and any vertical obstructions such as trees, utility poles, signs, fences, or other obstacles. Greater separation may be required by the District where grades exceed 4 percent.
- Clearing of Vegetation - Regardless of bike path surface, all vegetative material within 4 ft. of the bike path shall be removed prior to bike path construction. This requirement shall be specified by the Designer and included on the approved plans. 4.) Overhead Clearance - All bike paths shall have a minimum of 10 ft. clear vertical distance above the path.

28.6.3 Cross Section

Typical cross-sections shall be provided for all critical points (i.e. change in grade, direction) along the length of the bike path.

28.6.4 Grade

- Profile - A profile of the proposed bike path construction shall be included in the construction plans or site plan. If the bike path profile is not consistent with the roadway profile, provide a separate profile for the bike path.
- Minimum and Maximum Grade - Minimum grade shall be 0.60 percent except in sag curves where proper drainage is provided by cross slope. The minimum grade shall be waived if cross slope is 2 percent and good drainage is provided off the side and is unobstructed. Maximum grade shall be five percent or as allowed by **ADA**.

28.6.5 Design Speed

- Paved Surfaces - For paved surfaces a minimum design speed of 20 Mph shall be used. Where grades exceed 4 percent, a design speed of 30 Mph shall be used.
- Unpaved Surfaces - For unpaved surfaces, a minimum design speed of 15 Mph shall be used. Where grades exceed 4 percent, a design speed of 25 Mph shall be used.

28.6.6 Horizontal Alignment

- Minimum Radius of Curvature - The minimum radius of curvature negotiable by a bicycle is a function of the super elevation rate of the bicycle path surface, the coefficient of friction between the bicycle tires and the bicycle path surface, and the speed of the bicycle.
- Formula for Radius Calculation - The minimum design radius of curvature shall be based upon the following formula:

$$R = \frac{V^2}{15(e/100 + f)}$$

where:

R = Minimum radius of curvature (ft.)

V = Design speed (Mph)

e = Rate of bikeway super elevation (percent)

f = Coefficient of friction

- Rate of Super elevation - Bicycle path super elevation rate shall be a minimum of 2 percent (the minimum necessary to encourage adequate drainage) and a maximum of 3 percent.
- Coefficient of Friction - The coefficient of friction depends upon speed, surface type, roughness, and condition; tire type and condition; and whether the surface is wet or dry. Friction factors used for design should be selected based upon the point at which centrifugal force causes the bicyclist to recognize a feeling of discomfort and instinctively act to avoid higher speed.
- Coefficient of Friction Values - Extrapolating values used in highway design, design friction factors for paved bicycle paths can be assumed to vary from 0.31 at 12 Mph to 0.21 at 30 Mph. Unpaved surface friction factors are to be reduced by 50 percent to allow a sufficient margin of safety.

- **Minimum Radius** - Based upon a super elevation rate (e) of 2 percent, and 20 degrees lean angle, the minimum radius of curvature to be used is 90 ft. for 20 Mph.
- **Substandard Radius Curves** - When substandard radius curves must be used on bicycle paths because of ROW, topographical, or other considerations, standard curve warning signs and supplemental pavement markings shall be installed in accordance with the **MUTCD**. The negative effects of substandard curves can also be partially offset by widening the pavement through curves.

28.6.7 Sight Distance

Refer to the **Roadway** chapter within this manual, and the **AASHTO Guide for the Development of Bicycle Facilities** for sight distance requirements.

28.6.8 Cross Slope

The cross slope shall be 2 percent.

28.6.9 Drainage

Storm drainage is the responsibility of both the District and WASA. Run-off issues related to the District's catch basins are the responsibility of WASA.

- **Requirements and Standards** - All bike path designs shall satisfy the storm drainage requirements of the District's utilities department. Bike paths located within the District ROW shall meet DDOT standards.
- **Ditch Placement** - Where a bike path is cut into a hillside, a ditch shall be placed along the high side of the bike path to prevent sheet flow across it.

28.6.10 Safety Considerations

- **Consideration of Pedestrians** - The safety of pedestrians, and others who may use or travel on a bike path shall be a prime consideration in the bike path design.
- **Clearance Between a Bike Path and a Street** - No bike path shall be constructed directly adjacent to street curb or street pavement. Minimum separation shall be 5 ft. For sections with less than 5 ft. separation, a barrier is required.
- **Barriers and Other Safety Devices** - For bike paths adjacent to streets with speed limits over 25 Mph, and with slopes greater than 6 percent,

the District may require special safety measures. Examples include barriers or other safety devices between the roadway and bike path, or an increase in the distance between the bike path and highway. Barriers should be a minimum of 42 in. high and should not obstruct sight distance at intersections.

- Signs for Hazards and Regulatory Messages - Standard signing and pavement markings in the **MUTCD** shall be specified in the design of the bike path to alert bike path users to hazards and to convey regulatory messages.
- Intersection Grade - Maximum grade of the bike path at intersections is 3 percent extending for 30 ft. in each direction from the centerline of the intersection.
- Curb ramps - Standard curb ramps will be provided at all bike path curb crossings to allow continuity of bike path use by bicyclists and pedestrians. Curb depressions equaling the bike path width shall be used, with the bike path surface sloping to the pavement at 1:12 maximum slope.

28.6.11 Bicycle Path Bridges

- Crossings of Water Courses - All bike paths require either a bridge or a fair weather crossing wherever possible.
- Pedestrian Crossings on Major Collectors and Arterials - On all District major Collectors and Arterials, necessary due to traffic conditions, where over/underpass won't create a personal security issue, underpass or overpass (grade separated) pedestrian crossings should provide for neighborhood bike paths.
- Railings, Fences, or Barriers. Railings, fences, or barriers on both sides of a bicycle path structure shall be a minimum of 3.5 ft. high.
- Smooth rub rails should be attached to the barriers at handlebar height of 3.5 ft. Barriers should not impede storm water runoff from the path.
- Bridge Underpass Lighting - All bike path bridge underpasses shall have lighting in accordance with the **Street Lighting** chapter within this manual.

28.6.12 Bicycle Path Underpasses

- The minimum clearances for underpasses are as follows:
 - Horizontal: 10 ft. from abutment to curb or edge of water, 12 ft. if equestrian accommodation is required.
 - Vertical: 10 ft. from trail surface to underside of bridge. 12 ft. if equestrian accommodation is required.

- The trail surface elevation shall be at or above the high water mark for the 10-year storm.

28.6.13 Signage and Pavement Marking

- Basic Requirements - All signs, except locally adopted bike route signs, shall conform to **MUTCD**.
- Painted Centerline on Curves - All curves with restricted sight distances are required to be painted with a centerline to separate traffic. The centerline shall be 4 in. in width and painted yellow.

28.6.14 Intersections

The following requirements apply to all bike path intersections with either streets or other bike paths:

- Curb Ramps - Curb ramps the same width as the bike path shall be provided at each intersection.
- Sight Distance - Sight distance requirements shall be in conformance with **AASHTO Guide for the Development of Bicycle Facilities**. The Designer shall ensure sufficient stopping and intersection sight distance at all bike path intersections and curves, particularly where steep grades are proposed at bike path/ roadway intersections. Obstructions to the visibility of motorists or bike path users shall be removed or the bike path aligned around the obstruction to maximize visibility.
- Turning Radius at Intersections - The minimum turning radius at bike path intersections shall be 20 ft.

28.7 Bicycle Parking

28.7.1 Bicycle Racks

- The preferred bicycle rack style shall be “Inverted U”.
- Other rack styles, placed in public space, must be approved by the Bicycle Program Manager.

28.7.2 Off-Street Bicycle Parking Spaces

- Bicycle parking shall be equivalent to 5 percent of the off-street vehicle parking with a minimum of two spaces per DCMR, Title 11. Each Inverted U rack provided will count as two bicycle parking spaces.

28.7.3 Placement of Bike Racks in Public Space

Racks shall be within 30 ft. of building entrances and located a minimum distance as follows from any wall (refer to Table 28-A below):

Table 28-A

| Bike Orientation | Min. Distance of Rack from Wall |
|-----------------------|---------------------------------|
| Parallel to wall | 24 in. |
| Perpendicular to wall | 30 in. |

NOTE: Covered parking is encouraged where possible.

7.) Traffic Impacts

- Attach the following maps (and/or table of values):
 - Capacity and volume/capacity ratios
 - Peak hour intersection level of service
 - Traffic signal and access improvements

8.) Special Analysis/Issues

- Present brief information on any special analysis or issues that have influenced the results of this traffic impact study.

9.) Required Mitigation Measures/Recommendations

- Attach “Recommended Improvements Summary Sheet”
- Attach a map showing level of service resulting from recommended improvements.
- Attach scaled map or aerial photograph showing proposed improvements.